深圳维盛半导体科技有限公司

VS12L10A IC手册参考

VS LED Driver Micro-Controller

36 CHANNEL LED DRIVER; SELECTABLE PWM FREQUENCY

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GENERAL DESCRIPTION

VS12L10A is comprised of 36 constant current channels each with independent PWM control, designed for driving LEDs, PWM frequency can be 3kHz or 22kHz. The output current of each channel can be set at up to 38mA (Max.) by an external resistor and independently scaled by a factor of 1, 1/2, 1/3 and 1/4. The average LED current of each channel can be changed in 256 steps by changing the PWM duty cycle through an I2C interface.

The chip can be turned off by pulling the SDB pin low or by using the software shutdown feature to reduce power consumption.

VS12L10A is available in QFN-44 (5mm ×5mm) package. It operates from 2.7V to 5.5V over the temperature range of -40° Cto +85° C.

FEATURES

- 2.7V to 5.5V supply
- I2C interface, automatic address increment function
- Four selectable I2C addresses
- Internal reset register
- Modulate LED brightness with 256 steps PWM
- Each channel can be controlled independently
- Each channel can be scaled independently by 1, 1/2, 1/3 and 1/4
- PWM frequency selectable
  - ✓ 3kHz (default)
  - ✓ 22kHz
- -40°C to +85°C temperature range
- QFN-44 (5mm × 5mm) package

APPLICATIONS

- Mobile phones and other hand-held devices for LED display
- LED in home appliances

TYPICAL APPLICATION CIRCUIT

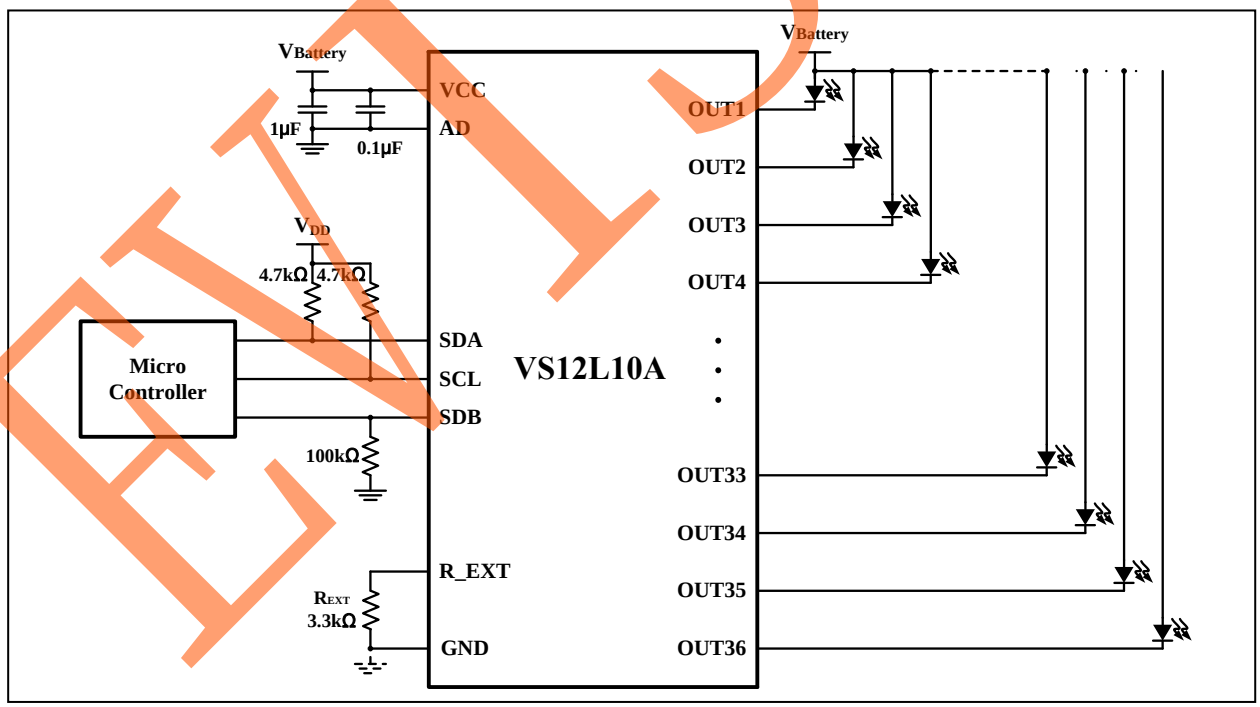
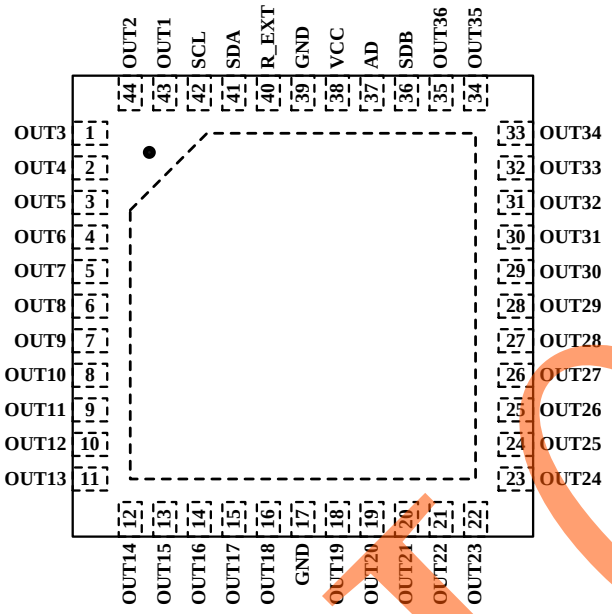


Figure 1 Typical Application Circuit

Note 1: The maximum global output current is set to 23mA when R_{EXT} = 3.3kΩ. Please refer Page 11 for setting LED current.

PIN CONFIGURATION

Package	Pin Configuration (Top View)
QFN-44	

PIN DESCRIPTION

No.	Pin	Description
1~3	OUT3 ~ OUT5	Output channel 3~5 for LEDs.
4~16	OUT6 ~ OUT18	Output channel 6~18 for LEDs.
17,39	GND	Ground.
18~30	OUT19 ~ OUT31	Output channel 19~31 for LEDs.
31~35	OUT32 ~ OUT36	Output channel 32~36 for LEDs.
36	SDB	Shutdown the chip when pulled low.
37	AD	I2C address setting.
38	VCC	Power supply.
40	R_EXT	Input terminal used to connect an external resistor. This regulates the global output current.
41	SDA	I2C serial data.
42	SCL	I2C serial clock.
43,44	OUT1, OUT2	Output channel 1, 2 for LEDs.
	Thermal Pad	Connect to GND.

ORDERING INFORMATION
Industrial Range: -40°C to +85°C

Order Part No.	Package	QTY
VS12L10A	QFN-44, Lead-free	2500/Reel

ABSOLUTE MAXIMUM RATINGS

Supply voltage, V_{CC}	−0.3V ~ +6.0V
Voltage at SCL, SDA, SDB, OUT1 to OUT36	−0.3V ~ V_{CC}+0.3V
Maximum junction temperature, T_{JMAX}	160°C
Storage temperature range, T_{STG}	−65°C ~ +150°C
Operating temperature range, T_A	−40°C ~ +85°C
Package thermal resistance (Mounted on JEDEC standard 4 layer(2s2p) PCB test board), $R_{\theta JA}$	32.65°C/W (QFN)
ESD (HBM) ESD (CDM)	±8kV ±1kV

Note:

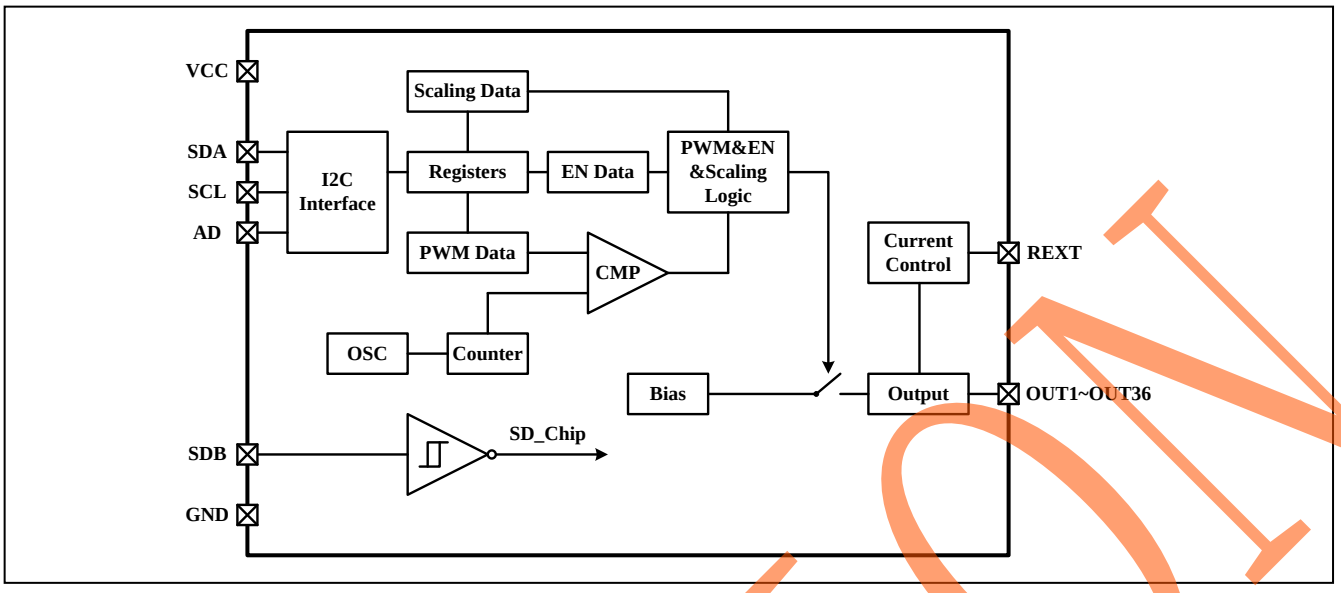
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

Typical values are T_A = 25°C, V_{CC} = 3.6V.

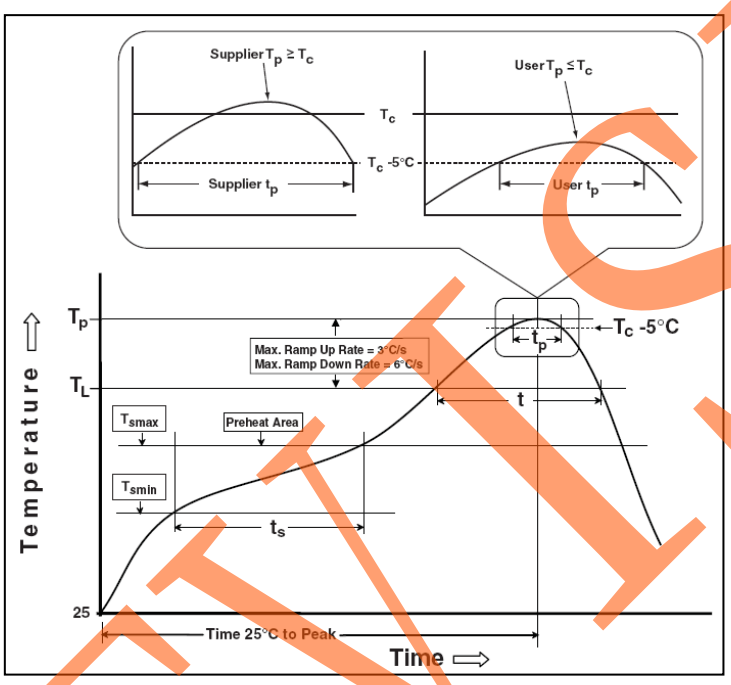
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		2.7		5.5	V
I_{MAX}	Maximum global output current	V_{CC} = 4.2V, V_{OUT} = 0.8V R_{EXT} = 2kΩ, SL = "00" (Note 1)		38		mA
I_{OUT}	Output current	V_{OUT} = 0.6V R_{EXT} = 3.3kΩ, SL = "00"		23		mA
V_{HR}	Headroom voltage	R_{EXT} = 3.3kΩ, I_{OUT}=20mA		0.4	0.6	V
I_{CC}	Quiescent power supply current	R_{EXT} = 3.3kΩ		9		mA
I_{SD}	Shutdown current	V_{SDB} = 0V or software shutdown T_A = 25°C, V_{CC} = 3.6V		3	5	μA
f_{OUT}	PWM frequency of output	0x4B=0x00		2.9		kHz
		0x4B=0x01		21.6		kHz
I_{OZ}	Output leakage current	V_{SDB} = 0V or software shutdown, V_{OUT} = 5.5V			0.2	μA
T_{SHDN}	Thermal shutdown			160 (Note 2)		°C
$T_{SHDNHYST}$	Hysteresis			20 (Note 2)		°C
V_{EXT}	Output voltage of R-EXT pin			1.3		V
Logic Electrical Characteristics (SDA, SCL, SDB)						
V_{IL}	Logic "0" input voltage	V_{CC} = 2.7V			0.4	V
V_{IH}	Logic "1" input voltage	V_{CC} = 5.5V	1.4			V
I_{IL}	Logic "0" input current	V_{INPUT} = 0V		5 (Note 2)		nA
I_{IH}	Logic "1" input current	V_{INPUT} = V_{CC}		5 (Note 2)		nA

FUNCTIONAL BLOCK DIAGRAM



CLASSIFICATION REFLOW PROFILES

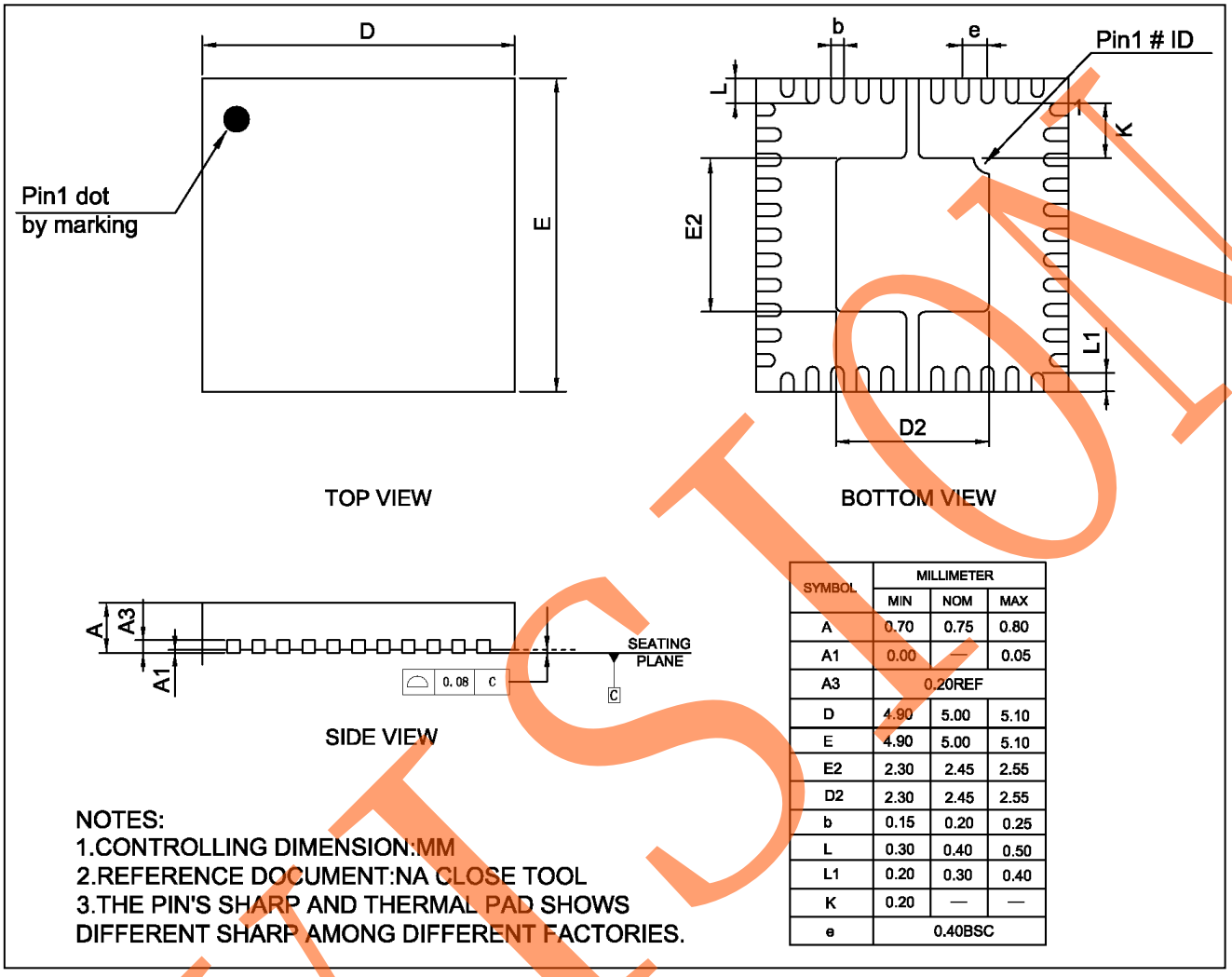
Profile Feature	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	150°C 200°C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3°C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	217°C 60-150 seconds
Peak package body temperature (Tp)*	Max 260°C
Time (tp)** within 5°C of the specified classification temperature (Tc)	Max 30 seconds
Average ramp-down rate (Tp to Tsmax)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.



Classification profile

PACKAGE INFORMATION

QFN-44

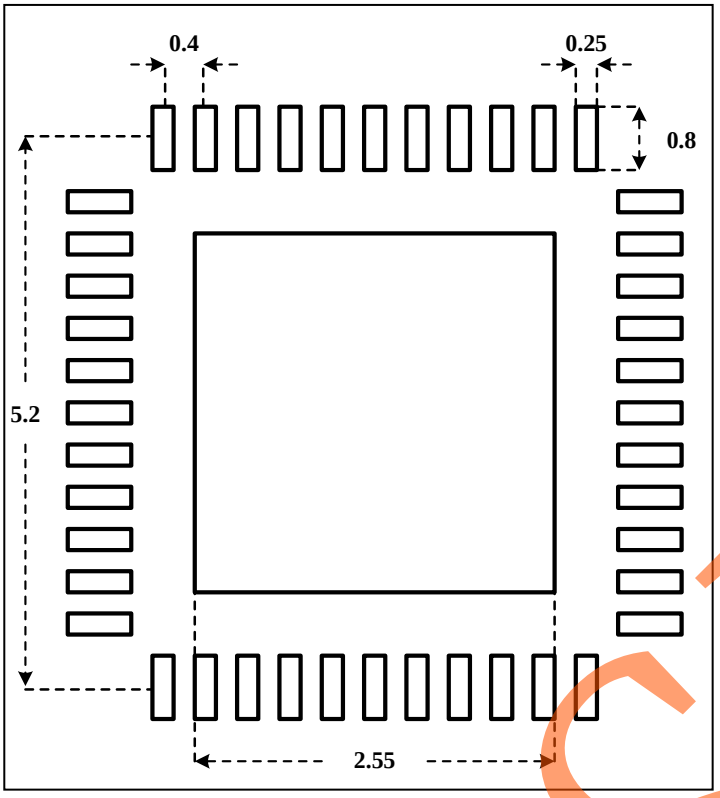


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	—	0.05
A3	0.20REF		
D	4.90	5.00	5.10
E	4.90	5.00	5.10
E2	2.30	2.45	2.55
D2	2.30	2.45	2.55
b	0.15	0.20	0.25
L	0.30	0.40	0.50
L1	0.20	0.30	0.40
K	0.20	—	—
e	0.40BSC		

NOTES:
1.CONTROLLING DIMENSION:MM
2.REFERENCE DOCUMENT:NA CLOSE TOOL
3.THE PIN'S SHARP AND THERMAL PAD SHOWS DIFFERENT SHARP AMONG DIFFERENT FACTORIES.

RECOMMENDED LAND PATTERN

QFN-44



Note:

1. Land pattern complies to IPC-7351.
2. All dimensions in MM.
3. This document (including dimensions, notes & specs) is a recommendation based on typical circuit board manufacturing parameters. Since land pattern design depends on many factors unknown (eg. user's board manufacturing specs), user must determine suitability for use.